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11.3 Reactions in Aqueous Solution > Net Ionic Equations

Net Ionic Equations

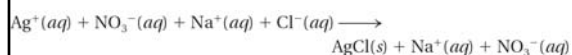


What does a net ionic equation show?

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11.3 Reactions in Aqueous Solution > Net Ionic Equations

A **complete ionic equation** is an equation that shows dissolved ionic compounds as dissociated free ions.



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11.3 Reactions in Aqueous Solution > Net Ionic Equations

An ion that appears on both sides of an equation and is not directly involved in the reaction is called a **spectator ion**.

The **net ionic equation** is an equation for a reaction in solution that shows only those particles that are directly involved in the chemical change.

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11.3 Reactions in Aqueous Solution > Net Ionic Equations

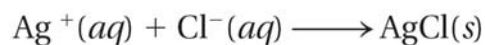


A net ionic equation shows only those particles involved in the reaction and is balanced with respect to both mass and charge.

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11.3 Reactions in Aqueous Solution > Net Ionic Equations

Sodium ions and nitrate ions are not changed during the chemical reaction of silver nitrate and sodium chloride so the net ionic equation is



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CONCEPTUAL PROBLEM 11.9

Writing and Balancing Net Ionic Equations

In the photograph, aqueous solutions of iron(III) chloride and potassium hydroxide are mixed. A precipitate of iron(III) hydroxide forms. Identify the spectator ions and write a balanced net ionic equation for the reaction.



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CONCEPTUAL PROBLEM 11.9

1 Analyze Identify the relevant concepts.

Write the complete ionic equation for the reaction, showing any soluble ionic compounds as individual ions. Eliminate aqueous ions that appear as both reactants and products. Balance the net ionic equation.

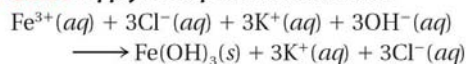
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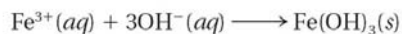
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CONCEPTUAL PROBLEM 11.9

2 Solve Apply concepts to this situation.



The spectator ions are K^{+} and Cl^{-} . The balanced net ionic equation is



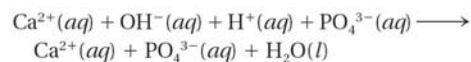
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Practice Problems for Conceptual Problem 11.9

28. Write the balanced net ionic equation for this reaction.



ChemASAP
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Problem Solving 11.28 Solve Problem 28 with the help of an interactive guided tutorial.

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11.3

Reactions in Aqueous Solution

> Predicting the Formation of a Precipitate

Predicting the Formation of a Precipitate



How can you predict the formation of a precipitate in a double-replacement reaction?

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11.3

Reactions in Aqueous Solution

> Predicting the Formation of a Precipitate



You can predict the formation of a precipitate by using the general rules for solubility of ionic compounds.

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11.3 Reactions in Aqueous Solution > Predicting the Formation of a Precipitate

Table 11.3
Solubility Rules for Ionic Compounds

Compounds	Solubility
Salts of alkali metals and ammonia	Soluble
Nitrate salts and chlorate salts	Soluble
Sulfate salts, except compounds with Pb^{2+} , Ag^+ , Hg_2^{2+} , Ba^{2+} , Sr^{2+} , and Ca^{2+}	Soluble
Chloride salts, except compound with Ag^+ , Pb^{2+} , and Hg_2^{2+}	Soluble
Carbonates, phosphates, chromates, sulfides, and hydroxides	Most are insoluble

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11.3 Reactions in Aqueous Solution > Predicting the Formation of a Precipitate

Will a precipitate form when a sodium carbonate solution is mixed with a barium nitrate solution?

$$2\text{Na}^+(aq) + \text{CO}_3^{2-}(aq) + \text{Ba}^{2+}(aq) + 2\text{NO}_3^-(aq) \longrightarrow ?$$

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11.3 Reactions in Aqueous Solution > Predicting the Formation of a Precipitate


Sodium nitrate is soluble but barium carbonate is insoluble. The net ionic equation is

$$\text{Ba}^{2+}(aq) + \text{CO}_3^{2-}(aq) \longrightarrow \text{BaCO}_3(s)$$

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11.3 Section Quiz.

Assess students' understanding of the concepts in Section 11.3.

Continue to: Section Quiz -OR- Launch: 

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11.3 Section Quiz.

1. Identify the correct net ionic equation for the following reaction and the spectator ion, if there is one.

$$\text{FeO}(s) + 2\text{HClO}_4(aq) \rightarrow \text{H}_2\text{O}(l) + \text{Fe}(\text{ClO}_4)_2(aq)$$

- $\text{FeO}(s) + 2\text{H}^+(aq) + 2\text{ClO}_4^-(aq) \rightarrow \text{H}_2\text{O}(l) + \text{Fe}_2^+(aq) + 2\text{ClO}_4^-(aq)$; no spectator ion
- $\text{FeO}(s) + 2\text{H}^+(aq) + 2\text{ClO}_4^-(aq) \rightarrow \text{H}_2\text{O}(l) + \text{Fe}_2^+(aq) + 2\text{ClO}_4^-(aq)$; ClO_4^- is a spectator ion
- $\text{FeO}(s) + 2\text{H}^+(aq) \rightarrow \text{H}_2\text{O}(l) + \text{Fe}^{2+}(aq)$; ClO_4^-**
- $\text{FeO}(s) + 2\text{HClO}_4(aq) \rightarrow \text{H}_2\text{O}(l) + \text{Fe}(\text{ClO}_4)_2(aq)$; no spectator ion

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11.3 Section Quiz.

2. Which one of the following products of double-replacement reactions would NOT form a precipitate?

- AgCl
- PbSO_4
- $\text{Mg}(\text{OH})_2$
- $\text{Mg}(\text{NO}_3)_2$**

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11.3 Section Quiz

3. Which reaction will NOT produce a precipitate from aqueous solution?

